RESOURCE NEEDS FOR REGULATIONS

ON

KENAI NATIONAL WILDLIFE REFUGE

Region 7
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INTRODUCTION

Kenai National Wildlife Refuge (NWR) is one unit of the national wildlife refuge system. Its large size (1.97 million acres), wilderness dependent wildlife, and resident mammal species distinguish it from the many small migratory bird-oriented refuges in the lower-48. In an Alaskan context the refuge is not outstandingly large. It is unique, however, because it is accessible by road and nearby to a metropolitan area bringing recreational use to levels many times higher than at other refuges in Alaska. In addition, the kinds of visitor use is also fairly atypical of the refuge system; for example, fishing, hunting, and wildlands recreation is pursued throughout the refuge. Camping, backpacking, canoeing, boating, and aircraft use are commonplace activities in order to pursue wildlife and wildland recreation in such a large area.

An estimated 500,000 visitors use the refuge each year. In 1984 over 210,000 angler-days and 34,000 hunter-days were spent on Kenai NWR associated primarily with roadside campgrounds, access areas, roads and trails. Developed campgrounds, road, lake and river access points, fly-in lake access, cleared hiking and skiing trails, and canoe routes opened nearly all of the refuge to hunting, fishing, and trapping. These developments mean recreational use can potentially be distributed over a wide ranging area. Yet--intolerably crowded conditions exist at access sites and prime fishing areas during the period of high public use from May to October. Protecting refuge resource values from this degree of public use and accomodating the unusual management situations that arise requires a higher degree of regulatory control than will be found at other refuges in Alaska.

The Kenai National Wildlife Refuge Comprehensive Conservation Plan, Environmental Impact Statement and Wilderness Review (CCP) outlines a general strategy to maintain and rehabilitate the diverse wildlife and wildland values. A Record of Decision implementing the preferred management alternative was signed on June 27, 1985. The proposed regulations are consistent with the alternative selected for implementation. These regulations are the tools the refuge manager needs to implement the plan.

The Code of Federal Regulations 50 Part 36.476, Alaska National Wildlife Refuges Public Participation and Closure Procedures states that "... in determining whether to close an area or restrict an activity otherwise allowed, the Refuge Manager shall be guided by factors such as public health and safety, resource protection, protection of cultural or scientific values, subsistence uses, endangered or threatened species conservation, and other management considerations necessary to ensure that the activity or area is being managed in a manner compatible with purposes of which the Alaska National Wildlife Refuge area was established." (Emphasis added.)

Section 1110(a) of the Alaska National Interest Lands Conservation Act of 1980 (ANILCA) provides for "....the use of snowmachines during periods of adequate snow cover....), motorboats, airplanes, and nonmotorized surface transportation for traditional activities.... Such use shall be subject to reasonable regulations by the Secretary to protect the natural and other values of the conservation system units, national recreation areas, and national conservation system units, national recreation areas, and national conservation areas, and shall not be prohibited unless, after notice and hearing in the vicinity ofthe affected unit or area, the Secretary finds that such use would be detrimental to the resouce values of the unit or area."

This document discusses the resource values that have been or will be detrimentally impacted without reasonable regulations. During the rulemaking process, hearings will be held at various locations on the Kenai Peninsula and in Anchorage to receive public comments. None of the proposed regulations or rulemaking process is contradictory to or attempts to side-step the actual or intended purpose of Section 1110(a).

Since 1941, harvest methods, seasons, and access restrictions have been used on a permanent or temporary basis in cooperation with the State of Alaska. Although aircraft and motorboats have been allowed, their uncontrolled use by a large number of persons has been proven detrimental to resources. Without exception, every case of over-harvest or critical wildlife disturbance was related to heavy motorized access into remote areas. State regulations, such as prohibiting same day airborne hunting and localized prohibitions against the use of aircraft or off-road vehicles for big game hunting were responses to critical situations. Prior to restricting aircraft in the 1960's--local guides were literally selling "moose on the hoof." They were shooting a moose, loading and flying it out--all in the same afternoon (refuge files). The Kenai NWR CCP addresses both the positive and negative benefits of various access means outlining reasonable access goals that balance protecting wildlife with reasonable access opportunity.

Historically, the Fish and Wildlife Service has managed the refuge to provide opportunity for wildlife-wildlands enjoyment in a natural setting--a primary purpose of the refuge as directed by ANILCA. During the 1960's, extensive canoe trails, campgrounds, and access trails for hikers, horsemen, and roadside motorboaters were developed. In Alaska--where trails and road access is relatively limited because of distances, this program was readily accepted by the public. As a result, visitors use the refuge because of established non-motorized management programs and specific recreational opportunities. This past season, over 20,000 visitor days were recorded within the Swan Lake and Swanson River National Recreation Canoe Trails--trails that have been closed to aircraft use for at least 10 years. In a user survey conducted in 1974 respondents reported solitude, observing wildlife in a natural setting, and wilderness canoeing as the primary attractions (Shone 1979). Presently, campgrounds on roadside lakes are often filled to capacity. Hiking trails into lakes less than five miles from the road are increasingly used by organized groups and individuals. In addition, small businesses (outfitters/guides) have evolved to service these non-motorized recreational users.

It is well documented that arctic and subarctic systems are the most fragile of all ecosystems. They require years to recover from damage. Because of these delicate ecosystems fish and wildlife, vegetation, soils, and archeological resources have been protected from unregulated mechanical use by regulations since the pre-ANILCA days (the refuge was then known as the Kenai Moose Range).

Disturbances have several immediate effects on animals. As they respond they expend their energy reducing their reserve (Calef et al., 1976; Geist 1978; McCool 1978). This is critical for animals with low fat reserves such as geese at staging areas or bears as they emerge from hibernation in early spring, and animals already under physiological stress due to pregnancy or insect harassment (Geist 1971; Ream 1980; Gilliam and Lent 1982). Calef et al., (1976) stated that caribou running in cold weather are likely to develop pulmonary disorders. Animals harassed to the point of panic may injure themselves by stumbling or colliding with each other while fleeing (Calef et al., 1976). Anderson (1971) reported a Dall ewe had broken its neck; he suspected it fell while running down a slope to escape aircraft. He also observed several instances where Dall sheep fled across steep talus slopes.

Even when animals display no overt reaction to disturbances their energy balance can be affected. MacArthur et al., (1979) recorded the heart-rate responses of bighorn sheep to disturbing stimuli and found 78% of the responses either preceded or occurred in the absence of any overt behavioral response. Kanwisher et al., (1978) recorded an increase in a herring gull's heart-rate from 160 beats per minute (bpm) to 440 bpm, with no outward indication of alarm as a child approached it. Kanwisher et al., (1978) and MacArthur et al., (1979) surmised the heart-rate response was in anticipation of the need for flight.

Repeated disturbances cause animals to change their pattern of daily activity or to withdraw from habitat leading to inefficient use of habitat (Geist 1970; Cowan 1974; McCool 1978). Animals may avoid the disturbing agent by assuming secretive, nocturnal habits. Thornburn (1973) found disturbances by people during the day led ducks to confine their feeding to nighttime hours. Elgmork (1978) reported brown bears in a small, remnant population in Norway survived because of their inclination to withdraw from contact with people. Many studies documented shifts in the distribution of animals due to disturbances. Faro and Eide (1974) stated prior to restrictions disturbances by photographers caused brown bears to avoid McNeil Falls (Alaska). If animals perceive a stimulus as harmless their response may habituate, declining with repeated encounters (Peeks 1969; Geist 1970). Any animal habituated to a potentially disturbing stimulus, however, will then be vulnerable if the stimulus--without warning--becomes dangerous.

Aircraft

The proposed aircraft regulations are necessary because the refuge is less than 20 air miles from Anchorage. Nearby towns in the Matanuska Valley are expanding at some of the highest growth rates in the entire nation. Kenai, Soldotna, and Homer--adjacent to the refuge are also expanding at tremendous rates. In addition, Alaskans have the highest per capita use of airplanes in the nation. As of March 1985, 3,894 airplanes were registered in the Anchorage area, 723 in the Matanuska Valley, and 896 in the Kenai Peninsula/Cook Inlet area.* As of March 1984, there were 6,468 licensed pilots in the same area. With 68,000 new residents in Anchorage between 1980 and 1984, and with 5,513 aircraft within a 75-mile flying distance to Kenai NWR, traditional level of aircraft use is only an historic concept. Literally hundreds of aircraft may potentially use any given area on a weekend and at any time of year.

As early as 1965, certain areas were established on the Kenai National Moose Range to provide both wildlife and refuge users sanctuary from unrestricted aircraft use. The logic used was that areas fairly close to the road system were the only places a hunter, hiker, trapper, or boater could go without competing with the greater access afforded by airplanes. A very few aircraft users were displacing large numbers of visitors seeking to enjoy traditional activities on the refuge in a relatively natural setting. It was reasoned an airplane user should be encouraged to fly 15 minutes further to more remote lakes where their use would not compete with or pose a safety hazard to roadside visitors with no other alternatives for access.

In considering the impact of aircraft use on wildlife and wildland resources, and public safety, it is impossible to consider the single aircraft trapper landing on a remote lake to harvest a beaver without considering the literally dozens of persons likely to land on the same lake the same day. In short, the collective impact of numerous aircraft must be the beginning point of the discussion. Considering the history of impacts of aircraft on resources and the potential for impact, it is generally viewed by the refuge staff that unlimited aircraft operation in certain areas would be detrimental to refuge resources. The number of aircraft operations in southcentral Alaska far exceeds the land and wildlife's capacity to withstand uncontrolled access to all refuge lands.

The effect of unrestricted aircraft use on the Kenai NWR can be divided into two categories: first, direct disturbance to wildlife, habitat, or other visitors due to noise or direct physical disturbance; and second, the indirect effect of facilitating excessive harvest of wildlife. This harvest level may harm the well being of the population or make wildlife less visible to visitors. Both of these impacts were the justification for aircraft restrictions in place prior to 1980. Although the existing level of aircraft use on the refuge prior to 1980 was still causing significant negative impacts to wildlife, the negative impacts accelerated after 1980 in the absence of regulations.

*Telephone conversation with Federal Aviation Administration spokesperson, April 10, 1985, Anchorage District Office.

Examples of vegetative damage can be seen at several locations on the Chickaloon Flats where the collective effect of aircraft landings in several areas denuded vegetation that will take years--perhaps decades to return to its former state. At one defacto landing area at least eight aircraft crashed during the summers of 1983 and 1984. In 1964, Refuge Manager Will Troyer pointed out over 20 different landing strips that had developed during the previous hunting season--physically harming alpine areas, displacing Dall sheep to non-traditional range, and displacing traditional hunters from customary hunting areas. In 1983-84 the refuge staff recorded significant wildlife and traditional user displacement similar to that recorded prior to 1964 in the absence of appropriate regulations.

Thousands of lakes on Kenai NWR can be used to focus aircraft operation away from areas where their impact can be harmful to wildlife. Aircraft operators have traditionally used floats in summer to land on designated Kenai lakes and used wheels or skis to land on the same frozen lakes in winter. The proposed regulations seek to reinstate this traditional use in order to avoid development of defacto landing strips in sensitive open fields such as the Chickaloon grass flats and alpine benchlands. Land-based landings encroach on areas that provide sanctuary for Dall sheep, mountain goat, grizzly bear, caribou, wintering moose, and other wildlife. By having predictable places such as designated lakes open to aircraft operation, wildlife may adjust to disturbances.

Considerable literature supports the concept of providing established points of human entry in order to reduce the stress of surprise or random contacts (Aune, 1981; Geist, 1970; Dunning, 1971).

A primary objective of refuge management is to provide a high quality hunting and wildland experience within the carrying capacity of game populations. Kenai NWR records show hunting opportunities are much greater with non-mechanized means of access than through mechanical means provided nonmotorized access is available in the general area. With unrestricted aircraft use, one moose may yield a few hours of aircraft-accessible hunting experience but the same moose will provide many days of hunting experience to the man afoot. For example, during a 20-day season prior to 1964, wheeled aircraft were permitted to land in the mountains among the Dall sheep. In 1964, the refuge restricted aircraft landings to designated lakes and rivers in the general area. Concurrently, the sheep hunting season was doubled to 40 days. The refuge sheep kill remained relatively constant yet the opportunity to hunt more than doubled (correspondence from Acting Director Ray R. Vaughn to Senator Stevens, 6/10/75).

Closing certain lakes to float planes during ice-free periods is meant to protect waterfowl, waterbirds, and seabirds from the disturbances associated with landings, taxiing, and take-off. This proposed aircraft closure is designed to maintain remote lakes for the needs of wildlife.. It is also designed to reduce human-use of remote lakes during the sensitive nesting, brood-rearing, and molting periods as well as protect staging areas prior to migration.

When lakes are frozen, they are travel routes for wintering large mammals (moose, wolves) and furbearers. Because of the abundance of lakes, aircraft can land within close proximity of such wildlife. Closing certain lakes to aircraft during winters reduces human-wildlife contacts when many resident species are most physiologically stressed.

Waterfowl, waterbirds, and seabirds are sensitive to aircraft when nesting, rearing broods, molting, and congregating on staging areas prior to migration. Since aircraft disturbance is greater when the aircraft is low the greatest disturbance occurs during landings, taxiing, and take-offs (Gilliam and Lent 1982; Steinhart 1970). Repeated use of lakes by floatplanes has been shown to result in decreased waterbird densities on lakes and erratic waterfowl sleeping and feeding schedules (Schweinsburg, et al., 1974). Disturbances appear to be less severe on larger lakes because birds have more room to avoid the aircraft. Moulting birds appear especially intolerant to disturbances and may leave lakes by walking overland because they are flightless. Waterbird densities on lakes exposed to aircraft landings were less than half (31 birds/km2) compared to lakes where no landings occurred (83 birds/km2) (Ibid).

The areas indicated for closure to aircraft in the regulations include most of the small lakes, which the majority of waterfowl, waterbirds, and seabirds prefer. Smith (1981) reported that the majority (72%) of 1,658 loons using 1,758 lakes on the Kenai NWR were on lakes 2.5-20 ha in size and up to 21% were on lakes 20.5-80 ha in size. The refuge now supports the highest reported densities of loons in North America--about one adult loon per 10.7 ha of water (Smith 1981). Loons on lakes where engine noise is not allowed have been shown to be more successful hatching eggs and producing broods than loons on lakes where such disturbance is permitted (Titus and VanDruff 1981). Furthermore, loons produce more surviving young where human use is the lowest (Ibid).

Evidence suggests the common loon is a declining or extirpated species in much of the northeastern United States due to human disruption and development of its habitat. Its continued presence in the lower-48 may be in jepordy. (Ibid). Smith (1981) concluded, "Provided the KNWR lakes that are now remote, stay remote, this loon population should not be subjected to the problems that have caused declines in loon populations in northeastern and mid-western United States." Closing the smaller lakes to floatplanes will insure aircraft do not adversely impact the loon, waterbirds, waterfowl, and seabird populations on these lakes.

Approximately 50% of all trumpeter swan nesting sites within the refuge occur within the proposed aircraft closure areas. Those occurring outside these core areas or within the core areas but open for other reasons will be closed from May to September to protect remaining nesting and brood-rearing trumpeter swans, since nesting begins in May and swan cygnets are flightless until late September. Their nests are conspicuous and subject to more human contacts than smaller, waterfowl. It is well documented that visits to waterfowl nests lead to increased nest desertion and predation (Hammond and Howard 1956; Macinnes and Miara 1972).

Evidence collected over 27 years of aerial surveys, banding of over 100 swans, and a recent radio telemetry study still in progress indicates swans have already abandoned traditionally-used nesting lakes now used by aircraft. They are being forced to use less-productive lakes for nesting and brood-rearing to avoid humans.

To avoid aircraft, swan families with flightless cygnets may travel overland in attempt to reach a more remote lake and be taken by predators on their way. The forced and rapid movement of cygnets from one body of water to another less secure appeared to be the greatest factor leading to higher mortality rates of swans in another Alaska study (Hansen et al., 1971). Because trumpeter swans often use a number of lakes in addition to the nesting site, protecting a core area of lakes and ponds from aircraft use as proposed in this regulation will not only insure a minimum of aircraft disturbance to swans but provide an area where swans and other waterfowl have freedom to select the most favorable sites for nesting and rearing.

Closure of lakes in designated areas to airplanes on the northern region of the Kenai NWR throughout the year is part of the Kenai CCP to reduce the intensity of aircraft disturbance to wintering wildlife because of the close proximity, numbers, and distribution of lakes within wintering habitat. For example, most of the proposed closure area lies within successional stage forest habitat used by overwintering moose. Densities average 3.7 moose/mi2 and sometimes reach 20 moose/mi2 in the proposed closed areas.

It is known moose often react strongly to aircraft flying lower than 61m (McCourt et al., 1974) and that cow moose with calves appear most sensitive to disturbances by aircraft (Klein 1973). Disturbances are particularly detrimental when moose are under other physiological stress such as during cold winters with deep snow, late pregnancy, calving, and the insect season (Geist 1973). Moose in this particular habitat of the refuge area are in poor physical condition in the late winter because of declining forage (Franzmann and LeResche 1978). Minimizing disturbances associated with landings, taxiings, and take-offs will benefit moose overwintering in the area by minimizing their energy expenditure.

Aircraft access into the more remote areas of the refuge is also contributing to excessive harvest of certain furbearers in the northern region of the refuge (Peterson et al., 1984). Remote areas closed to aircraft and other motorized access in the past served as natural refugia from which dispersing wolves, lynx, beaver, and other furbearer emigrated to fill in vacancies left by harvest in the more accessible sites. For example, the intense harvest of lynx in the northern region of the refuge resulted in the closing of the entire region to lynx trapping beginning with the 1984-85 season and to the shortening of the season throughout the remainder of the refuge from 120 to 47 days. Data indicate extremely high (up to 86%) mortality rates from trapping and population levels are well below potential.

Similarly, wolf harvest in northern refuge areas easily accessible by aircraft has been extremely high with some packs being reduced to 1-2 individuals at the end of trapping seasons (Ibid). Pack sizes have been reduced from an average of 12 to an average of 6 by trapping. Packs previously receiving little harvest because of the remoteness of their habitat are now subject to exploitation rates as high as the packs residing near roads. Aircraft is the principal mode of access used to harvest these remote wolves.

In addition, beaver are especially susceptible to harvest in aircraft accessible areas because of their conspicuous lodges. Even with only nonmotorized access, active beaver lodge distribution in the canoe systems has slowly changed to where the majority are in the more remote regions. When airplanes were permitted into the system during the 1984-85 season because of the lack of access regulations, 100% of all active beaver lodges on aircraft accessible lakes within the systems were being trapped using aircraft. Some lakes have had the beaver trapped out in one season of uncontrolled access. The intense and persistent harvest of beaver may be preventing the refuge population from increasing beyond its relatively small size. Few beaver are available to colonize underutilized habitat when entire colonies are taken. Remote areas serving as natural refugia for beaver no longer exist on the northern refuge because remote lakes with active beaver lodges are being trapped by trappers using aircraft.

Restriction of unauthorized aircraft landings in other portions of the refuge is proposed to protect fragile alpine habitats and the associated wildlife populations. Few safe areas are available for landings in these areas because of the lack of lakes. Most potential landing sites are in alpine areas and actual landing sites must be artificially cleared and maintained. These habitats are used year round by mountain sheep, wolves, and wolverine; seasonally by moose, brown and black bear; and will soon be used by caribou reintroduced from the Nelchina Basin.

Dall sheep are considered to be among the most sensitive of animals to aircraft disturbance (Foothills Pipelines (Yukon) Ltd 1976, 1979; MacPherson et al., 1972; Yukon Wildlife Branch 1977) and often react very intensely, sometimes running as far as 1-1/2 miles from an aircraft passing at an elevation of 1,500 feet (Feist et al., 1974). Rams may react to aircraft 1-2 miles away flying at 7,000-8,000 feet by running into cliffs for protection (Linderman 1972). Aircraft landings in alpine areas on the refuge will detrimentally impact Dall sheep populations because sheep are distributed throughout the entire area.

Caribou were once present in the proposed aircraft closure areas, however, they were extirpated by humans in the early 1900's. A cooperative effort is underway to reintroduce caribou into suitable alpine habitats. Caribou are most sensitive to aircraft during the late calving period and in early winter (Calef and Lortje 1973; Calef et al., 1976). Caribou usually respond more strongly to close aircraft (Klein 1973). Since caribou are expected to restrict their movements to subalpine and alpine areas after reintroduction, repeated aircraft disturbance associated with landings and take-offs could prevent caribou from utilizing habitat available to them in this region.

The status of the brown bear on the Kenai Peninsula is currently of concern to the Service, the Alaska Department of Fish and Game, and the Forest Service. Since the strong-hold of the brown bear lies within the subalpine and alpine habitats of the proposed aircraft closure area, this closure would not only reduce disturbance to brown bears but reduce human contacts contributing to an increasing number of brown bears being killed on the peninsula in defense of life and property (Holdermann 1984). Quimby (1974) stated brown bear seemed more sensitive than ungulate species and McCourt et al., (1974) found them more sensitive to aircraft than moose or caribou. Because bears often run wildly, possibly causing overheating (Kucera 1974) and hide in dense cover, aircraft disturbance is considered most severe in tundra habitat (Jakimchuk 1975).

Of 36 responses by bears to fixed-wing aircraft, observed by Harding and Nagy (1980), 61% were overt running and hiding. Of 17 responses to helicopters, 88% were overt running and hiding. Quimby (1974) reported 53 bears approached by fixed-wing aircraft, 73% responded moderately or strongly while of 120 approached by helicopter, 90% were affected. Thirty-two percent of the bears were already running when they were sighted, several of these at one-half mile and one individual at approximately one mile from the aircraft. Many bears continued running until they were out of sight (Quimby 1974).

While tracking ten bears to their dens by helicopter in early winter, the aircraft inadvertently caused five of them to abandon the dens (Quimby 1974). Quimby also reported a single low pass with a helicopter was usually enough to dislodge a bear from a carcass where it was feeding. Two or three passes always caused bears to abandon the carcass, at least temporarily. He concluded any stimulus that causes a bear to leave a high-quality food source must involve a considerable amount of stress. This same sensitivity of brown bears to aircraft disturbances in various habitats including the open alpine areas has also been observed by the refuge staff during field studies when trying to locate and collar bears (1984).

Although protecting wildlife is a primary concern and the justification for developing regulations for Kenai NWR an examination of the literature and refuge files indicates other reasons exist to apply airplane zoning and restriction. These include enhancing public safety and protecting wildland recreation and wilderness values. For example, the Swan Lake/Swanson River canoe routes are premiere attractions and designated national recreation trails. These routes are a natural display of wildlife and solitude present in a wilderness canoeing experience. An extraordinary beaver harvest during the 1984-85 season adversely affected viewing opportunities of beaver for many years in this area. In addition, dozens of complaints were received during the 1984 canoeing season describing disturbances by floatplanes landing on these trails (refuge files).

In a public recreation study conducted in 1980 36% of recreationists surveyed reported increased use of aircraft at their favorite recreation area would make it less attractive to use (Clark, Johnston, Field 1981). As road and trail access developed in the 1960's, so did conflicts with aircraft use. It became evident collective mechanized intrusion of aircraft was not compatible in many locations in regards with public safety and with the experiences sought by visitors.

A zoning pattern describing the types of use was developed in the late 1960's that would solve some conflicts and at the same time reduce impacts. The zoning patterns continued until recently allowing uses where the needs of all publics can be met with minimum conflict. Many locations exist on the refuge where negative wildlife effects are less than critical and where other users cannot reasonably go without using aircraft. The majority of these locations became the designated aircraft operation areas: 1) north of the Kenai River where the majority of the area has been and will remain open to aircraft use. (Of over 1,000 lakes in this area, over half will remain open to all-season airplane operation.) 2) south of the Sterling Highway compatible designated lake landing areas will provide basic access to the majority of all refuge locations while at the same time minimize resource and user conflicts.

Zoning and control of airplane use on the Kenai NWR has been well received and recognizably justified as early as the late 1960's. Basic wildlife protection, public safety, and recreation opportunity zoning need has increased tenfold since that time. The recent inadvertent relaxation of airplane regulations has been poorly received by the majority of visitors as evidenced by complaints to refuge and regional office staffs both informally and by formal comments during the CCP planning process. The majority of respondents to various alternatives within the planning process supported the previous airplane restrictions.

The proposed regulations restrict the operation of ultralight aircraft on the refuge. Ultralights are not subject to most of the same pilot and aircraft licensing requirements as airplanes. Ultralights are able to land on much smaller lakes subjecting those areas to the same disturbances as larger lakes. General areas where lakes are designated for aircraft operations are designated because it is assumed small lakes are not available for normal airplane operation--thus providing some santuary for wildlife. Wildlife including swans, loons, beavers and other furbearers have been displaced or affected from aircraft operation on larger lakes. In many cases, nearby smaller lakes became the only remaining areas of nondisturbances--only to later used by ultralight aircraft. During the 1983-84 hunting season, dozens of complaints were received from the public regarding opertaing ultralights on the refuge. Many stated that ultralight operators were harassing moose, other wildlife, hunters and people. Identification is nearly impossible because they are not licensed nor are they required to display identifying numbers

Motorboats

In general, the entire refuge will be authorized for motorboat operation with exceptions to protect and maintain various aquatic habitats, spawning areas, waterbird nesting sites, and other resource values. Year-round and seasonal restrictions on motorboat use on the Kenai River are necessary in order to protect the riverine fish and wildlife populations and habitats. In legislative findings in the bill establishing the Kenai River Special Management Area the following was concluded: "The (Alaska) legislature finds that the Kenai River is an important natural resource and that must be protected and preserved for the maximum benefit of all Alaskans. The vitality of the Kenai River is threatened.

Motorboat wakes and stream bank development have contributed to the erosion of the river's bank and the degradation of its fish beds. Increased use on the river endangers fish and wildlife habitats." The legislature further stated--"the river's fishery and wildlife are its most important resources. The highest priority uses of the river and its adjacent land derive from its fishery and wildlife resources which must be protected and preserved to ensure their renewability and continued usefulness."

Kenai NWR's portions of the Kenai River, particularly above and below Skilak Lake support many species of resident waterbirds for feeding, nesting, or during migration. Consistent with the legislature's findings--the Service documented that eagles, beaver, river otter, moose, bears and other wildlife use these areas and that the expanding recreational use may cause displacement of species if that use is not monitored and controlled.

It is proposed that motorized watercraft be restricted along a three-mile section of the Kenai River downstream from the outlet of Skilak Lake between March 15 and April 30 to protect waterfowl staging area. This area is important to waterfowl because it is often ice-free during the winter and it is nearly always ice-free in the early spring when waterfowl--especially trumpeter swans first appear on the peninsula. Few other areas are available for migratory and arriving resident waterfowl at that time. As another important but off-refuge staging area--the lower Moose River area--becomes more developed and subject to increasing human disturbance the on-refuge Skilak Outlet area will be more valuable. Furthermore, waterfowl are in a precarious physical state when they arrive on the Kenai because little food is available and energy resources are already depleted.

Up to 14 trumpeter swans overwintered in this section during the 1960's; up to 300 swans have been observed staging at the outlet in spring; and current surveys (March 15, 1985) along the river revealed 99% of the goldeneye, 95% of the mallards, and 41% of the mergansers observed along a 10-mile section of the Kenai River below Skilak Lake were using the proposed controlled area. On March 27, 1985, 10 trumpeter swans were already using this section of the river because of its lack of current, shallow depths, and availability of foods relative to the rest of the river.

Boating has been documented to be highly disturbing to wintering waterfowl. Batten (1977) recorded the impacts of boats on such waterfowl and concluded use of wintering areas was much higher on areas inaccessible to boats. For example, the number of mallards per weekend count declined from 123 when the area was closed to boating to 25.8 after the area was opened to boats. Humel (1976) reported goldeneyes, a species common on the Kenai River, were extremely sensitive to boaters--reacting from boats by flying and leaving the disturbed areas for periods up to one week.

Displacement of swans from this area is documented and appears to be related to increasingly heavy use by power boats through the resting area. In some areas swans have been totally displaced. This proposed regulation will prevent accelerating disruption and ensuring the future of this area as an important spring swan staging area.

The regulation closing the Kenai River above Skilak Lake to motorized use will also favor the continued use of this area as an important winter resting and nesting area for bald eagles. All active bald eagle nests along the upper Kenai River within the refuge boundaries occur within the proposed area closed to motorized watercraft. Although the response of nesting bald eagles to human disturbances is highly variable because some individuals become tolerant of humans and others select alternate nest sites the fact that most bald eagle declines occur in the most heavily populated areas suggests human disturbance is a major factor causing the decline (Fyfe 1977). Bald eagles appear most sensitive to disturbances during nest initiation and the early stages of nesting. Disturbances that cause adults to flush from the nest may result in nest desertion or in embryonic mortality due to rapid cooling of the eggs (Murphy 1965; Fyfe and Olendorff 1976). Studies on the Kenai NWR have shown that bald eagle productivity is lower in areas with high human disturbance (Bangs and Bailey 1981).

The upper Kenai River within the refuge boundary is also important habitat for nesting and wintering waterfowl and includes some of the highest quality aquatic furbearer habitat along the Kenai River. It is high value habitat because there are many side channels with standing water where species such as beaver, otter, and mink find habitat for denning and feeding. The historical use of the upper Kenai River area has been primarily by rafts, canoes, and kayaks with intermittent motorized use. As recreational and sportfishing use increased on the lower Kenai River, large numbers of power boat users began to cross Skilak Lake and negotiate the Kenai Canyon with large jet boats. This stretch of river has several white water sections and many side channels. Powerboats must maintain a high rate of speed to go up river, thus distributing a very large wake to shoreline areas.

Increasing numbers of motorboats utilizing side channels could cause significant disturbances to otter, beaver, spawning salmon and streambanks. Jetboats churn spawning gravel in side channels and spook salmon attempting to spawn. Brown bear, black bear, moose, and other mammals have used the shoreline of the Kenai River as a natural route of travel and the collective impact of motorized boats is substantial. Motorboat travel in this section of river is only marginally safe requiring considerable maneuvering, varying speeds, and motor "revving." The report, "Erosion and Salinization in the Kenai River, Alaska," (USGS 1982) stated...."there is an indication that a recent increase in bank erosion may be occurring in response to river use practices such as wave action and developments." It is believed a relatively large number of the public will be well-served by the closure as the majority of use in the area at present is non-motorized and will cause little or no disruption to shoreline areas, salmon spawning beds, or to the wildlife.

The Kenai River above Skilak Lake is believed to be the most heavily used drift and float river within Alaska. An estimated 3,000 persons floated this section during 1984. The refuge authorized approximately 14 special use permits within this area for commercial, non-motorized driftfish and wildlife observation. One guide alone rafted this section of river with over 1,200 persons during 1984. Drifting rafts and canoes may pass by eagle nests, eagles, beaver, mergansers, river otter, moose, and an occasional bear while causing little or no disruption to the wildlife or other visitors.

In this way, thousands more annual outdoor recreation visits can be provided and still remain compatible. This particular section of the Kenai River is the last remaining undisturbed section where people may experience the Kenai as a wild and natural waterway. The historic experience and traditional river activities may be lost without the proposed regulations.

A conflict between large motorized jet boats became quite apparent in 1982 when state-imposed boat restrictions on the lower Kenai went into effect to reduce crowding off-refuge below Skilak Lake. The new state regulations, however, had the effect of displacing dozens of powerboats a day to the historically non-motorized white water sections of the upper Kenai. Action is necessary to prevent the deterioration of the wild character and wildlife values of the upper Kenai River. The increasing number of jet boats attempting to "pioneer" the Kenai River canyon pose considerable safety hazards to less maneuverable non-motorized boats. The upper Kenai River closure is compatible with the entire Kenai River's status as the state legislature recognized it a "Special Management Area." In addition, a special Governor's Task Force reported on the management of the Kenai River recommending protection in its preliminary examination (Kenai River Task Force 1983).

The proposed closure of motorized watercraft within the Swan Lake and Swanson River canoe systems is designed to protect nesting and brooding rearing waterfowl, waterbirds, and seabirds, as well as maintain a high quality wilderness canoeing opportunity. Although the impact of canoeists on loon productivity is unclear, loons on lakes where motors were not allowed were more successful at hatching eggs and producing broods than those on lakes where motors were permitted (Titus and VanDruff 1981). Waves produced by passing motorboats destroy loon nests, especially if water levels are high (Vernur 1973). Red-necked grebes, a common waterbird in the canoe systems, are particularly sensitive to human activity. They leave their nests if motorized watercraft travel within 150m of their nests and this contributes significantly to the loss of eggs (Kristensen and Nordstrom 1979). Nesting success among grebes has been shown to be higher in areas that not accessible to boats (Balter 1977).

Thousands of canoeists use the Swan Lake and Swanson River canoe routes each year. Canoeists reported observing wildlife was an important factor in their visiting the area. Fishing, solitude, wilderness appreciation, and canoeing were other reasons for choosing the routes. It is common to observe moose and new-born calves along the shoreline areas of the lakes and moose are often seen on islands. They use the shoreline of lakes as an escape route from predators. The low impact nature of canoeing use allows a large number of persons to enjoy wildlife without dramatically altering their activities.

Many of the same justifications and information discussed under aircraft disturbance to the Swan Lake/Swanson River Canoe Trails is applicable to the proposed motorboat regulations. The use of motorboats on several rivers--including Killey, Swanson, and Moose rivers is authorized; however, horsepower restrictions are proposed.

The Funny, Chickaloon, Swanson, and Moose rivers are small streams barely negotiable with any boat except a canoe in most conditions. However, allowing up to a 10-horsepower craft will allow upstream travel during periods of adequate stream flow. Larger engines (and boats) would find it difficult to negotiate these rivers besides the potential damage they would do to the streambed.

The Swanson and Moose Rivers are part of the Swan Lake and Swanson River Natural Recreational Canoe Trails and the vast majority of use is downstream canoeing to launching areas. Approximately 7,000 canoeing days of use occur on the Swanson and Moose Rivers (Kenai NWR Public Use Records, 1984). The combination of vegetated stream banks, a narrow meandering stream, and hundreds of canoeists would make large horsepower use of the river a significant public safety hazard. Large outboards would find passage difficult in most instances causing continued churning of bottom gravel, sediment, and aquatic vegetation.

The Killey and Fox Rivers are perhaps two of the wildest rivers on the Kenai National Wildlife Refuge. Brown and black bear and moose use these river banks as a natural highway. Waterfowl, beaver, otter, and mink are abundant. Eagles feed and roost adjacent to these rivers that support important runs of salmon. The Moose and Killey Rivers are critical Kenai River salmon spawning tributaries. A major portion of the Kenai River's early run of Chinook salmon migrate up the Killey River (Burger et al, 1983). One of the refuge's largest concentrations of brown bears occurs in the Benjamin Creek area of the Killey River (Kenai NWR files). The Killey River has numerous shallow areas and log jams where motor boat navigation requires constant racing and revving of engines. Public use is presently very light particularly in the upper reaches of these rivers. The Kenai CCP calls for these river systems--entirely within Kenai Wilderness to remain pristine. Calling for a horsepower restriction on these rivers will reduce the impact of upstream travel on these two rivers by reducing the need for log jam removal, overall number of persons traveling upstream will remain low, and noise disturbance caused by large jet boats will not occur.

Boat traffic can adversely affect biological communities by increasing turbidity, re-suspending sediments and increasing shoreline erosion. Physical impacts of waves generated by boats depend on the size and shape of the boat, boat speed and draft, water depth, location of the boat in relation to the shoreline, and width of the channel (Bumm et al., 1973); Schulz 1978; Bhowmik 1975; Kariaki and Van Hofdten 1974; Johnson 1969; Camfield et al,, 1980; Das and Johnson 1970). Generally, a boat traveling fast in shallow water close to the shoreline generates the highest waves (Sorenson 1973).

The proposed "no wake" regulations for roadside lakes replace previously in-place horsepower restrictions. In effect this is a speed limit type restriction designed to allow basic access to all horsepower boats while minimizing any negative affect of a particular class of boat. These lakes are all relatively small lakes used primarily for rainbow trout fishing. The regulation will prevent the less thoughtful user from disrupting sport fishermen on the lake by such non-wildlife/wildland boating activities as waterskiing and racing. Conflicts will be reduced with canoers, shore fishermen, and users of non-motorized boats (Shelby, 1980).

In addition to reducing bank erosion caused by wave action, this regulation will maintain relatively undisturbed shoreline wildlife habitat. Although many of these lakes have already lost nesting waterbirds such as loons, a few remain and other waterfowl use these areas for feeding and staging while nesting on adjacent lakes. A no-wake restriction would allow appropriate access for refuge activities while reducing the potential to displace remaining wildlife.

Group size limitation on canoe routes is necessary to protect the soil, vegetation, wildlife, and the solitude of the canoe routes. In a 1974 visitor use study of canoe routes (Shone 1979) several instances of recreational campsite deterioration, shoreline vegetation loss, loss of solitude, etc. were recorded. Observations and a review of literature documents that large groups make more noise, use more firewood, cause more disturbances to wildlife, leave more litter than the sum of smaller groups. In research conducted in western national forests many wilderness backpackers reported that large groups during their outing negatively affected their experience (Stankey 1973). Group limitations are in place in many popular backcountry recreation areas in the lower-48 primarily to minimize negative impacts of overall recreational use. However, the group size limitation proposed in these regulations is greater than the size limit in most high use recreation areas contacted for a comparison. The average group size limitation from the other recreation areas was approximately 12 persons.

Groups as large as 60 persons have been observed using the canoe route system. Human waste after such a group's passage in the area is considerable. Noise levels become significantly higher than other wilderness users would prefer and portages become jammed with long waits. Much staff and volunteer time is spent picking up litter and repairing damage done by vandals. Two volunteers recently filled one 15-ft canoe with litter gleaned from an 18-mile stretch of the Swanson River Canoe trail (Oct 7-8, 1985). Seasonal workers usually spend three weeks before each Memorial Day to prepare areas for summer use removing garbage and rabbit entrails.

Group registration is the primary means by which overall use, geographic distribution, and characteristics is determined. Voluntary registration over a 10-year period has facilitated only an estimated 33% compliance rate. Accurate base data concerning use are needed to protect the Swan Lake/Swanson River Canoe Routes from overuse, crowding, and loss of wildland values. A recreational survey conducted in 1974 showed that by the mid-1970's the Swan Lake/Swanson River canoe routes were beginning to lose certain wildland values because of perceived crowding in certain areas. Use has steadily increased since 1974. In addition, a registration requirement would aid in search and rescue operations because a proposed route of travel would be logged at the time of registration. Registration would be a self-serve process located at various route entrances.

Off-Road Vehicles

Airboat use has been prohibited on Kenai NWR waters except Skilak and Tustumena Lakes and refuge portions of the Kenai and Kasilof Rivers since 1969. Air thrust boats including hovercraft are unauthorized on any Alaskan refuge because of high noise levels causing a disproportionate disturbance to nesting waterfowl, aquatic wildlife, and refuge users. Air thrust and air cushion boats in many situations are capable of traveling over wetlands cutting across meandering oxbow streams thus exhibiting many of the characteristics of an off-road vehicle which is unauthorized on national wildlife refuges. The fact that airboats and hovercraft cannot, by their very nature, be confined to solely navigable water areas underscores their potential to adversely affect refuge wetlands, mudflats, and shoreline habitats. The Refuge Manual includes both airboats and air-cushion vehicles in its off-road vehicle definition (8RM7.4) and prohibits their use on refuges as does the Code of Federal Regulations (50CFR 36.22).

Air thrust and air cushion boats are neither traditional nor popular on the Kenai NWR because the majority of boating situations require either open lake travel or a high degree of maneuverability, the two weak points of air boats. Despite their small number and overall lack of utility on Kenai NWR these craft have a high potential for causing disturbances because of their high R.P.M. aircraft engines. The noise associated with an airboat is similar to an airplane engine on take-off. While an airplane take-off is short lived and intermittent, the continuous blast of an airboat is considerably more pervasive. Airboats are especially dangerous on swift glacial rivers. A drowning that occurred on Fox River during 1984 tragically illustrates the potential for disaster.

Portions of the Kenai River and Skilak Lake which were open to airboat use are congested with outboard and non-motorized boat traffic. The relative nonmaneuverability during operation of airboats along the Kenai River poses a significant public safety hazard. The prop-wash of airboats also poses a hazard to others in tight boating situations common on the congested Kenai River. In approximately ten incidents of airboat use known to refuge staff since 1979, most resulted in complaints by other users. Two incidents resulted in capsizing (one drowning), two became hopelessly mired in wetlands between bends in a river when trying to cut across meanders. Three other incidents involved similar unauthorized uses.

Snowmobiles

Uncontrolled and unregulated snowmobile use cause considerable negative impacts to wintering wildlife, soil, vegetation, and traditional uses of resources enjoyed by most visitors as well as dramatically increasing the safety hazards to snowmobile operators and others.

The proposed regulations maintain the status quo regarding snowmobiles for describing the types of snowmobiles that can be used, when they may be used, activities a snowmobile operator may participate in, and where they may be used. A 1970 Environmental Impact Statement examined snowmobile use on the refuge proposing several options including unrestricted use, limited use, and prohibiting their use. That environmental impact statement pointed out several biological and social problems including:

1. Destruction of insulating qualities of snow thus affecting vegetation and small mammals.

2. "Disturbing wintering wildlife including Dall sheep, moose, and other species faced with stress factors of northern winters including temperature extremes, excitement, fear or running"--all described as harmful to animals during winter. The EIS documented incidents of moose, coyotes, wolves, and Dall sheep being chased and harassed by snowmobilers.

3. The EIS noted a significant increase in littering due to snowmobile operation and a negative impact on traditional forms of trapping and disturbances to historically present wildland recreational opportunities. The EIS also documented the non-traditional nature of snowmobile use on the Kenai Peninsula. (Also noted in Kenai NWR files).

A review of literature underscores several concerns documented in the EIS and observations by the refuge staff. As with aircraft, wildlife responses to disturbances by other vehicles varies with species, physical condition, past experience, actions of the vehicle, and environmental context (Altman 1958; Walther 1960). Small mammals and birds respond primarily to changes in vegetation structure and composition (Foin et al. 1977; Luckenbach 1978). Responses of small predators may reflect changes in the distribution of prey populations (Burke and Sherburne 1982). Large mammals respond directly to vehicles as well as indirectly to changes in vegetation.

Wildlife is more susceptible to unpredictable disturbances caused by vehicles that leave roads than by relatively predictable road traffic (Geist 1970). Although little research has addressed responses of large northern mammals to off-road vehicles (ORV's) influences can be made by comparing wildlife's responses to other off-trail users. Cornett et al., (1979) found deer that had become habituated to predictable human activity such as vehicles on roads and backpackers on trails commonly retreated from off-trail hikers. Dunaway (1971) presented evidence that reduction and in some cases elimination of populations of bighorn sheep coincided with increases in use of the areas by backpackers, off-trail hikers, and climbers.

Disturbance of caribou by moving vehicles elicits escape behavior and repeated disturbances can lead to avoidance of habitat (Klein 1980; Horejsi 1981). Snowmobiles in contrast with other ORV's are primarily used during winter--a critical time of year for many species (McCool 1978). Caribou, for example, are especially susceptible to disturbances in early winter (Geist 1971; McCourt and Horstman 1974). Alpine areas north of the Sterling Highway within the Indian Creek Area are critical habitat of a caribou herd reintroduced in 1975. Snowmobile operation in such a critical area would cause significant disturbances to this small herd.

Snowmobiles can have drastic though localized impacts on small mammals (Bury 1978; Raedeke and Taber 1983). Some small mammal species overwinter in the trapped air space between the soil and the base of the snow. Depending upon the depth and moisture content of snow, compaction may reduce or eliminate this space, lowering the temperature at the surface and reducing the amount of suitable habitat. This reduction in temperature can impact metabolic rates and the survival rate of small mammals. Snowmobiles also harden the surface of the snow preventing small mammals from burrowing (Neumann and Merriam 1972; Raedeke and Taber 1983). Secondary effects on populations of predators such as owls and foxes could also occur (Bury 1978; Raedeke and Taber 1983). Within extensive portions of the Caribou Hills (an alpine and subalpine area with heavy snowmobile use) many miles of snow cover becomes packed from multiple snowmobile visits.

Ferguson and Keith (1981) found that although moose appeared more tolerant of cross-country skiers than elk--moose showed greater avoidance than elk of areas within 500 yards of trails. Aune (1981) reported displacement of wildlife within 200 feet of snowmobile trails thereby affecting 17% of the total winter range. The animals also adopted a crepuscular pattern of activity. Aune concluded avoiding critical winter range due to disturbances by snowmobiles is likely to be a significant detriment to wildlife.

Variations in responses by different species may be due, in part, to different reactions of people upon sighting them (McCool 1978). Aune (1981) reported people who got off snowmobiles to approach animals caused them to flee. Ferguson and Keith (1981) found elk were more reactive than other ungulates to skiers. They also found skiers were more likely to move off the trail to approach elk than to approach other ungulates. Coyotes displayed no habituation and fled in all of the 10 encounters reported by Aune (1981). Wolves are likely to be very sensitive to disturbance (Chapman 1976, Bury 1978, Aune 1981).

Snowmobile use can result in substantial damage to vegetation. Wanek (1971) found the impact is usually greater in forest communities than in open areas, with (Wanek 1973) tree and shrub species particularly susceptible to physical damage or breakage especially when the snow cover is not deep enough to protect them. Research by Neumann and Merriam (1972) on the ecological effects of snowmobile use near Ottawa, Canada, revealed damage to shrubs, hardwood saplings, and small conifers was significant. They reported snowmobile metal cleats usually snapped off rigid stems up to one-inch in diameter while more pliable stems sprang back but often had much of the bark removed from upper surfaces.

After just one pass of a snowmobile they found over 78% of the saplings on a trail damaged, nearly 27% of those enough to cause death, and on heavily used trails all vegetation above the compacted snow was removed by the snowmobiles. Neumann and Merriam reported no significant differences in the frequency of damage between conifers and hardwood saplings but they noted growth deformities were likely to be more severe in conifers with leaders removed.

The effects of snowmobiles on old field and marsh vegetation were studied in Nova Scotia, Canada, (Keddy et al., 1979). Snowmobile treatments ranged from a single pass to five passes on five separate days. The first pass caused approximately 75% of the compaction observed after five sequential passes. Standing crop measurements the following summer showed significant reductions in the old field vegetation with increasing snowmobile use, however, marsh vegetation showed no significant effects probably because of solid ice cover during the winter. A study in Wisconsin on the effect of snowmobile traffic on blue grass (Poa pratensis) reported early spring productivity and vigor to be less on snowmobile traffic areas than on control areas, but measurements were comparable from all treatment plots by midsummer (Foresman et al., 1976).

Snowmobiles first appeared on the Kenai Peninsula in the early 1960's. The refuge staff was concerned about their displacing traditional activities such as trapping via snowshoes or dog team. The first areas on the refuge closed to snowmobile use were partially out of concern that actual traditional users could not compete with the more efficient and growing number of snowmobiles.

Width and weight restrictions are necessary to confine snowmobile use to non-racing, non-industrial recreational snowmobiles. Previous special regulations confined the width to 40 inches. Changes have been made to conform to slight width increases in popularly-available recreational models. The larger industrial vehicles such as snowcats are not considered snowmobiles and are thus eliminated by weight and width restrictions. Persons having a legitimate need for a non-recreational snow-going vehicle can obtain a Special Use Permit if use is justified. Using snowmobiles on maintained roads within the refuge is not proposed to be authorized for safety reasons and to conform to Alaska State law. Snowmobiles can cross a maintained road after following appropriate crossing procedures. This is consistent with state law and standard safety procedures.

The use of snowmobiles for racing purposes, harassment of wildlife species, or non-traditional activities is not authorized. This guideline is justified in that it simply is a further clarification of 50 CFR regulations regarding wildlife protection and appropriate activities allowed on Alaska National Wildlife Refuges.

ANILCA and Code of Federal Regulations Part 36.21 requires adequate snow cover be present and/or frozen river conditions before snowmobile may be used. The proposed special regulations would require the same conditions on Kenai NWR when the refuge manager publishes notice adequate snow cover and ice conditions are present. The open period could start no earlier than December 1st and end not later than April 30th. This finding of adequate snow cover requirement has been in place since 1965 and has worked out well with few problems or complaints.

Several reasons exist for the specific dates and affirmative finding of adequate snow cover requirements. Kenai NWR is located in a transition maritime/continental climate. A cold arctic front may cause winter conditions including snowcover of several feet to prevail throughout late October and with a maritime weather system replacing it in November causing thawing conditions and a return to less than adequate snow cover. Intermittent closures following premature openings tend to confuse the snowmobiling public and result in inadvertent resource damage.

December 1st and April 30th are the "outerlimits" to the beginning and end of continuous winter conditions on Kenai NWR. In recent years, however, almost zero snowfall conditions have prevailed throughout December and January. December 1st is a date when the majority of the refuge's lake ice is generally safe to walk or ride a snowmobile. Premature unregulated opening of the season would cause an increase in persons exposed to thin lake or river ice. Even though December 1st is the earliest possible date for reliable, safe, and continuous snowmobile opening--the intermittent weather conditions, type of snow cover, and varying local conditions on the refuge would justify the refuge manager's determination of adequate snow cover and public notice of the actual opening date.

Allowing each snowmobile operator to determine adequacy of ice or snow cover is untenable. This situation would subject resources and visitors to individual bias and error. Adequacy of snow is a judgmental decision based on consistency, overall depth, and underlying vegetation. No standard measurement exists by which most persons could determine for themselves whether snow is adequate. In addition, individual operators determining snow cover would be unenforceable. The refuge manager and his representatives are more familiar with local conditions, trained to make determinations, and are legally bound to determine if snow cover is adequate to protect soil and vegetation.

Moose rutting season occurs in October and November. Bulls in rut use open areas to display and gather cow moose for breeding activity. Bull moose are subjected to considerable fat reserve loss during rut and increased stress brought by early snowmobile activity could be detrimental. Snowmobiles often use open areas and disturbances is inevitable if activities coincide. Refuge biologists believe the majority of rutting is completed by late November or early December. Snowmobiles operating after December have a reduced chance of disturbing moose. Past illegal operations prior to December 1st are believed to be partly responsible for the disappearance of bull moose usually congregated at the treeline in open areas within the Caribou Hills (Kenai NWR files).

The proposed special regulations would restrict access in those general areas historically unauthorized for snowmobile operation as well as a partial restriction in one additional area. These areas include:

1. A small environmental education / cross country ski area adjacent to the refuge headquarters and visitor center.

2. An area which generally encompasses the Swan Lake and Swanson River national recreation canoe trails.

3. Areas above treeline on the refuge other than the Caribou Hills.

4. The Skilak Lake Special Management Area, except for the lake ice of Hidden and Engineer lakes.

To promote wildlife viewing opportunities, wildlife and habitat protection--the above diverse areas require wildlife and their habitats not be subject to direct and indirect effects of snowmobile operation. The direct effects include: damage to sensitive windblown alpine ridges and subalpine plains; displacement of big game animals such as moose, sheep, and mountain goats inhabiting critical winter range. The indirect affects include increased furbearer harvest due to ease of access. The Kenai NWR CCP calls for nonmotorized wildland recreation resource opportunities and opportunities for solitude. Snowmobiles were not present on the Kenai Peninsula prior to 1960 and fewer opportunities for snowshoeing, dogsledding or skiing free from snowmobile conflicts have resulted. It is also the goal of the Kenai refuge management to maintain certain areas where wildlife are not harassed or disturbed by mechanized snowmobile access in order to monitor effects of suspected problem areas such as the Caribou Hills.

As noted within the final Kenai CCP--Kenai NWR is close to several expanding communities. The impact of snowmobiles cannot be considered in terms of a lone trapper snowmobiling across a lonely river basin but rather of five to ten thousand snowmobiler days in a given portion of the refuge. Most of Kenai's snowmobiling is in fact simply non-traditional activities such as racing and group tag. Preventing use of snowmobiles for non-traditional activities is difficult to enforce and if snowmobile use is allowed in a given area--non-traditional use must unfortunately be assumed (Kenai NWR files). Snowmobiles, as a form of access, cannot be separated from the activity being pursued.

The proposed closed area between Tustumena and Skilak Lakes is entirely within the Andrew Simons Research Natural Area established primarily for a zoological value as a natural wildland laboratory. This area's alpine plain is particularly susceptible to both wildlife and vegetative disturbance. The terrain is such that snowmobiles are not contained to routes of travel and the impact would be broadcast through this wide open alpine plain. The original reasons for the restrictions in this area remain valid today.

It is necessary to restrict snowmobile use in the Skilak Lake Special Management Area because vegetation barriers have been removed in significant portions of the area. In the past, snowmobiles have been used on lake ice and on certain trails for basic access. This regulation will maintain the existing and predominant frozen lake access use, but prevent new use within moose habitat rehabilitation areas. Approximately 3,000 acres of dense vegetation have been manipulated (crushed) to create areas of enhanced moose browse for wintering moose. Large open areas have been subsequently created as a result. These areas have also unintentionally become excellent snowmobile areas because of their wide open character. Snowmobiling in these areas would defeat the purposes of the areas to provide moose wintering habitat if snowmobiling disrupted the activity. The proposed regulation will prevent use in critical moose wintering areas, but allow use on Hidden, Engineer, and Skilak Lakes.

Several studies have been undertaken to determine the impacts of snowmobiling on vegetation. There is no doubt that snowmobiles colliding with trees can cause deformities, result in disease, and in some cases, kill the trees (Wanek 1971; Wanek and Schumacher 1975). Smaller trees with less than three feet in growth above the snow are the most susceptible to damage.

Perennial plants with fibrous root systems seem to be most susceptible to snowmobile impacts (Bendickson 1973; Ryerson et al., 1977, Wanek and Schumacher 1975; Whittaker and Wentworth 1972). With lowered soil temperatures induced by snow compaction, fibrous root systems of perennials are susceptible to freezing (Wanek and Schumacher 1975). Some studies show that growth of spring flowers may be retarded or reduced as a result of the snow compaction (Wanek and Schumacher 1975).

Numerous studies have demonstrated soil surface temperatures beneath snow compacted by snowmobile traffic are significantly colder than those under undisturbed areas (Wanek 1971, 1973; Neumann and Merriam 1972; Foresman et al,. 1976). Specific gravities of snow compacted by snowmobiles were found to be tripled at the surface and at least doubled in deeper snow (Neumann and Merriam 1972). Because thermal conductivity of snow is proportional to the square of specific gravity, temperature gradients within the snow were less steep after passage of snowmobiles (Neumann and Merriam 1972). The resulting colder soil temperature under compacted snow retards growth of early spring flowers, reduces reproductive success of plants, and contributes to winterkill of herbs with massive underground perennating structures (Wanek 1971, 1973). Colder soil temperatures also retard soil microbial activity in the spring (Wanek 1973). Compacted snow also takes longer to melt thus affecting plant phenology in relation to unaffected areas (Neumann and Merriam 1972). Erosion can also be increased particularly if snowmobiles use slopes with little snow and if the vegetative cover is affected (Masyk 1973). South-facing slopes in the spring of the year are particularly susceptible.

In summary, there are several reasons for restricting snowmobile use within alpine areas of the Kenai Mountains. Moose often overwinter in timberline areas and disturbances during already stressful winter months could be harmful. Prior to heavy early season snowmobile use in the treeline areas of the Caribou Hills many moose were seen each year. However, the number of moose observed annually in these open areas decreased in proportion to increased snowmobile use. As discussed in the aircraft section, Dall sheep and brown bears are particularly sensitive to disturbances. The unconfined nature of snowmobile use in alpine areas of the refuge requires them to be confined to below treeline locations. Past and future transplants of caribou in alpine areas of the Kenai Mountains justifies the continued restriction on snowmobile use in critical habitat areas for caribou.

As also discussed in the aircraft section, the area including the lake region of the 1947 burn is a critical moose wintering area. Moose utilize frozen lakes and streams as natural routes of travel. Moose densities within the area coupled with the ease of access to this area call for restrictions on snowmobiles. The Swan Lake and Swanson River canoe routes are one of only a few areas where trappers, ice fishermen, and other winter recreationists have not had to compete with the snowmobile recreationists who, because of mobility, have greater ability to harvest wildlife.

Certain portions of these remote canoe areas still boast some furbearer populations such as beaver that are not over-harvested. Summer recreationists, hoping to see a beaver on the Kenai NWR would have few options remaining with increased efficiency of harvest facilitated by snowmobile trapping.

Hunting and Trapping

The firearms regulation is proposed to protect visitors and facilities. The discharge of firearms within campgrounds is perhaps the most complained about incident of campground behavior recorded on the Kenai NWR. The perception of safety is as important as actual safety to many refuge visitors. Indiscriminate shooting was a primary concern of persons attending various public meetings at the Kenai NWR in recent years. The liberal Alaska hunting seasons (year-round for hunting rabbits and black bears) give an individual an easy alibi for discharging firearms near other persons. "I was just shooting at a rabbit." This regulation allows a measure of common sense safety to be enforceable by preventing firearm discharges among concentrations of campers and refuge visitors.

It is also proposed that baiting for black bears on the Kenai NWR be authorized only by permit from the refuge manager. For safety reasons, unless zoned, bear baiters may concentrate bears into areas of the refuge where there is high public use (i.e. canoe systems, near campsites, etc.). Furthermore, this practice may condition some bears to associate human activity with food and thus increase the probability of human-bear contacts where people may be injured. It is imperative black bear baiting be zoned on the refuge to minimize this potential problem. Many unauthorized bear baiting stations are known to occur on the refuge where there is no warning to hikers or campers that a bear baiting station is present.

Brown bears may be attracted to bait stations and because of their aggressive nature may attack persons checking bait stations causing them to kill the bears in defense of life and property. The increasing rate of brown bear kills in defense of life and property is already of concern (Holdermann 1984). Little is known about the numbers, status, or movements of brown bear on the refuge. It is therefore imperative that black bear baiting occur in areas where there is low likelihood of encountering brown bears.

Finally, the impacts of bear baiting on local black bear populations are unknown. Kill rates of the state's radiocollared black bears suggest a high proportion (20%) of bears can be killed at bait stations if baiting efforts are concentrated in one region. To further evaluate the impacts of bear baiting on local black bear populations, baiting can be regulated through refuge permits to focus baiting activities in experimental or study areas if so desired.

The Fish and Wildlife Service has more restrictive regulations (50 CFR 32.2(i)) regarding the use of tree stands than state regulations. Unless hunters are aware of such regulations, which can be clearly defined in a permit, the refuge has no control over the number and location of blinds or the construction material used to build blinds.

The proposed regulations include restricting hunting and trapping in a limited area (environmental education complex area) to establish and maintain a safe and high quality wildlife viewing. This center is located in a boreal forest area adjacent to the city of Soldotna. The center has wildlife displays serving as a staging area for school groups using established and proposed nature trails. One of the purposes of the refuge mandated by ANILCA is to provide environmental education. An estimated 30,000 visitors used this site in 1984.

Continuing to allow hunting and trapping in this small area precludes its potential for a natural display of wildlife and presents a safety hazard. To enhance wildlife viewing opportunities, it is planned to place salt licks to attract wildlife without having animals unnaturally susceptible to harvest. The discharge of firearms in an area where people are concentrated is an unnecessary risk. September is also the local moose season and school groups use the trails heavily in early fall. Combining children in the woods with unrestricted hunting is not wise.

The practice of shooting wolves and other free-roaming furbearers such as otters and coyotes the same day airborne on the Kenai NWR is proposed to be prohibited primarily because of their susceptibility to "land and shoot trapping." This technique of so called "trapping" is simply hunting of furbearer species by use of a technicality in trapping regulations that allow a trapper to land and dispatch a furbearer the same day airborne. Alaska state law does not allow hunting the same day airborne for big game species. This highly controversial form of hunting conflicts with the intent of the Airborne Hunting Act which prohibits harassing or shooting of most species with the use of aircraft. Many persons participating in this form of "trapping" violate the Airborne Hunting Act by harassing furbearers in order to direct their movements prior to airplane landing.

Under the proper snow cover conditions, wolves on the northern refuge are highly susceptible to aerial "land and shoot trapping" because of the numbers of lakes which serve as landing sites. For example, some wolf packs on the northern region of the refuge have over 100 potential landing sites within their pack territories. Past studies have demonstrated that under the proper conditions of deep snow and frequent snowfalls, wolves can be easily tracked from light aircraft and shot. Up to 13 wolves per season in the northern refuge and the majority of entire packs can be taken using this technique (Peterson et al. 1984). Wolves on the Kenai NWR are already being controlled by harvest (Ibid) and allowing this technique for taking wolves to continue on the refuge will only generate more public controversy and potentially contribute to even higher harvest rates of refuge wolves.

Fishing

It is necessary to protect passengers and operators of the Russian River ferry from over-zealous fishermen. During salmon runs, fishermen line up shoulder to shoulder, casting weighted lines into the river. Fishing is so intense that when the ferry docks on the south side of the river fishermen repeatedly cast their lines even when the boat is docking with a full load of passengers. Operators and passengers have been hit with lead weights and hooked with salmon flies on many occasions. This docking area has been closed in the past by signs placed at the site at the request of the Special Use permittee for the Russian River ferry and the Alaska fisheries biologist. Failure to enact this regulation or otherwise close the docking area would result in injuries, conflicts between the Special Use permittee who trys to protect his passengers and the salmon fishermen, and possible tort claims against the government.

Other Public Uses

Camping is already restricted by an existing regulation limiting camping to fourteen days. The proposed regulations will maintain the fourteen-day limit but will not permit a camper to leave for a few hours then return for another fourteen days. This stay limit is necessary on a refuge such as Kenai NWR that receives over five hundred thousand users annually. Kenai NWR maintains over 50 campgrounds, access areas, waysides, and trailheads. Without this restriction people could use the refuge for semi-permanent squatting well beyond a reasonable recreational visit. Persons who have a need to stay longer than fourteen days can request a special use permit from the refuge manager.

The demand for camping space is so great at certain locations, such as Kenai-Russian River Access Area and Hidden Lake campground, that length of stay must be reduced so many persons as possible may visit and enjoy that particular location. Without such regulations the overall benefit to the public would be significantly reduced. Within developed facilities, the only way to insure safe and orderly parking and campsite occupancy is to designate sites for such use. Camping in non-designated areas blocks roads and trails, impacts soil and vegetation, reduces the overall attractiveness of the area, and causes crowding. Often vehicles block traffic as they park along the roads because of inadequate parking. On certain busy weekends, aerial surveys have recorded over triple the number of vehicles over the capacity of some campgrounds. Such congestion negatively impacts the social situation within the campground, causes vegetation loss where vehicles park at other than designated campsites ands overtaxes the sanitary facilities and solid waste disposal facilities.

Open fires within designated campgrounds are not authorized at other than approved fire grates for resource protection, aesthetic, and safety purposes. The large number of campfires expected to occur in a developed facility must be somehow confined to insure fire-susceptible tree roots, soils, and vegetation in the campgrounds are protected.

Campfires within designated fire grates are less likely to spread to surrounding natural fuels with the possibility of causing a wildfire. Wildfires on Kenai NWR are almost entirely human caused and several large wildfires were attributed to campfires not properly confined.

Only the use of dead and down timber for recreational campfires is authorized. This regulation is necessary to prevent the unauthorized cutting and removal of green trees and standing dead timber which, in many cases, provide habitat for several species of birds. It is also to prevent unsightly appearance of slash and stumps caused by random cutting adjacent to refuge campgrounds. This regulation minimizes the impact of recreational camping in high use areas. By requiring timber utilized be dead and down--it minimizes accidental cutting of standing green trees. This is particularly true for winter months when leaves are not present and a standing dead, deciduous tree cannot be readily distinguished from a green tree.

The regulation requiring pets to be on leashes is necessary because of sanitary, safety, aesthetic, and health reasons. A nine-foot leash allows a pet some freedom of movement yet still provides control. It is a length which also allows the animal to be tied at a campsite and not invade the neighboring camp. The campgrounds on the refuge are extremely crowded and contain many small children on busy weekends; leased animals are necessary to prevent many dogbites. In addition, the proposed leashing requirements for dogs would be consistent with state of Alaska's policy regarding pets within state parks.

The regulation allowing the removal of timber for home firewood users permits the refuge manager to provide wood for heating fuels and houselogs while at the same time conducting a moose habitat management program. Uncontrolled cutting and removal of timber causes loss of scenic and wildlife habitat values and creates fuel build-up in random areas. It also prevents using public cutting operations to aid in creating moose wintering areas. By requiring a special use permit to cut wood on Kenai, woodcutters become informed of standard acceptable logging practices, general refuge regulations, boundaries of cutting areas, and general conditions of use. In this sense, the permit becomes an individualized contract for insuring acceptable and safe woodcutting practices with maximum public benefit. Absence of such a program would render removal of wood for heating fuels and houselogs incompatible with refuge purposes.

The high use of many roadside recreation facilities, roadside parking areas, as well as the highly utilized backcountry trails and lakes at Kenai necessitates prohibiting unattended personal property for long periods of time. While campgrounds could be posted--accessible undeveloped roadside and backcountry areas could not all display a shortened time rule. For example--a person could leave equipment and gear at a popular campsite on the Kenai River and effectively prevent other persons from using the area for 12 months at a time. Literally thousands of recreational equipment caches could be established along such popular recreation areas as the Kenai River creating unsightly and uncontrolled situations. While an officer could monitor a 72-hour abandonment time period, enforcement of a 12-month limit is nearly impossible.

The 72-hour rule was in effect at the time of ANILCA's passage to insure an orderly and fair public use of refuge resources. It has been accepted by the user public and no problems have arisen as a result of this norm. Exceptions are possible and have been freely given when justified by outfitters, guides, and others. While there is a need to standardize a longer time period for remote refuges in Alaska, roadsides and heavy use refuges must be an exception in order to protect resources and user opportunities.

Skilak Lake within the refuge is unique in that it supports several island nesting sites for inland colonial nesting seabirds (cormorants and glaucous-wing and herring gull hybrids). Only one other island nest site for colonial seabirds has been documented on the refuge. It is also unique because it supports only inland nesting sites known for double-crested cormorants on the Kenai Peninsula. These nest sites have been monitored periodically since 1936 (Murie 1936). The colony is barely holding its own and one traditional nesting site near the Upper Skilak Lake Campground has already been abandoned perhaps because of frequent boat activity (Trapp and Nysewander 1985).

Although the declining number of adult cormorants and successful nest attempts may be related to competition and interference from gulls previous studies have demonstrated nesting cormorants have a low tolerance to human disturbance and readily desert their nests if disturbance is severe or repeated (Veimur 1970; Hogan 1978; Markham 1978). The cormorant nesting sites in Skilak Lake are either within 400 m of a boat launch site or near the route between Skilak Lake inlet and the boat launch. Each received high intensity use by boaters during the nesting period and people have been documented walking on the small nesting islands during the nesting period. Persons walking on the small island may disturb flightless chicks and eggs. The adult birds leave the island in large groups when disturbed thus causing considerable disturbances and possible mortality upon returning to the nest territory. Nesting islands have been observed being disturbed several times in one day. It is imperative that people be prevented from disturbing gulls and remaining cormorants by prohibiting access on and at least 100 m from the nesting islands.

The return of collars is a necessary tool for the successful completion of wildlife research and to reduce cost of research activities. It is important researchers discover the life cycle of animals including the location and method by which the animal was harvested. Various research projects on Kenai NWR use radio collars and other marking devices. While some equipment is returned to the refuge after harvest of an animal, others are held for various reasons. Individuals may choose not to turn in a research marking device judging such information may reflect negatively on the harvest practice. In some cases--thousands of dollars of research effort may be lost by non-retrieval of research markings. Radio collars can be re-used reducing the cost by 50%.

Prohibiting nonmotorized vehicles is necessary to prevent erosion from occurring on designated trails, alpine areas, and seismic lines. The use of non-motorized wheeled vehicles such as bicycles and carts that leave tracks and ruts is not compatible with the wildland character of the refuge. Failure to enact this regulation could cause more erosion on certain trails and increase maintenance costs on trails.

Wheeled, non-motorized vehicles have also been used on oilfield roads to facilitate removal of big game. Oilfield and utility roads are open to public use as a "trail". Many oilfield and utility roads still in use by industry have considerable traffic that poses a significant safety hazzard to slow-moving, non-motorized vehicles especially when obscurred by dust or darkness. The only other alternative to this proposed regulation would be to close the utility roads to all use other than by the permittee.

This regulation has been in effect previously by interpreting that prohibitions against off road vehicles include both motorized and non-motorized vehicles and by posting signs on certain potential problem areas. A closer look at the definition of off road vehicles in the 50 CFR showed that non-motorized vehicles are not included in the "off road vehicle" definition. This regulation will continue existing policy regarding use of such equipment.

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